

LEGO COMPETITION SYSTEM CONSTRUCTION -The Table - Here is information on building the competition table built and used by the educational outreach office at WPAFB Ohio. Additional information is available about Legs/Braces and Lighting construction.

By Bob Gemin, FLL Technical Director, Ohio

Jigs I find useful:

Measurement Jig: Pieces of scrap lumber is use to eliminate multiple measurements and the reading errors that often occur. You will see jigs used to set distances between stiffeners and jigs used to show were to drill to attach borders.

Construction Jig: The border is made from four boards, two full 8 footers and one 8 footer cut into two 45 inches boards. It is difficult to make the inside dimensions, 93 and 45 inches, constant. If the boards are straight and connected at 90 degrees the problem is solved. Cutting the 45 inch boards square and drilling the screws holes perpendicular to surface are needed actions to make a 90 degree junction. Even one best efforts in this regard may not be enough. I made a right angle jig that helps in keeping the table borders in specifications. With this jig, boards are held with clamps at 90 degrees while they are being screwed together. The result is a 90 degree junction. You will find pictures of the jig, note that the board rests on the large $\frac{3}{4}$ inch wafer board (OSB) so you will need other pieces of $\frac{3}{4}$ wafer board to keep the border level as you make the 90 degree junctions.

Process Jig: I recommend drilling perpendicular holes in the end of the 8 footers which is best done by a drill press. But that is difficult for one person so a holder, like the ladder shown, could be used to hold lumber.

Lumber selection and processing:

Surface: I recommend $\frac{1}{2}$ inch veneer (birch is reasonably priced) for the 4x8 foot sheeting. ($\frac{1}{2}$ inch may be really $\frac{15}{32}$; all plywood has been “downsized”). This may be \$15 to \$20 more than SPF (spruce/pine/fir) plywood but it is flatter, smoother, and more stable. Smoothness is becoming more important with future thinner mats.

Borders: Selection of the “stick” lumber is a very important step. The borders are made from 2x4s and I recommend finding a lumber yard with a large stack and one that doesn’t mind if you select. Sometimes even the economy grade has good 2x4s. Remembering the purpose: you want one 2 inch surface and one 4 inch surface on each board that is mainly knot free, it is easier to fill in a hole than to remove a raised knot, not twisted, and not very bowed (if at all). Most likely the 2x4s were recently in a strap bundle and held straight, so what you buy may not be as straight next month as it was when you bought it. The boards will relax and equalize. If you want a stable table, you want to give the wood some time to relax and then select again using the best for the sides and the worst for legs and light fixtures. I paint the wood as soon as I get the lumber home with flat black paint, wait for at least a month, select the lumber for the sides, and then smooth the important board sides with a hand plane and or fill holes with putty before assembly. Note that the plane takes off raised grain or paint drips but a raised knot may have to be drilled out and filled.

Optional Stiffeners and Legs:

The only firm requirement is for the table to have smooth inside surfaces with inside dimensions of 93 x 45 inches. At one time there was a specification of +/- 1/8 inch which was reasonable. I use 2x2 stiffeners glued to the table reverse side.

If competition tables are placed on typical cafeteria tables, you may not need stiffeners. But then the table top height would be about 30 inches high. The specified table height is 24 inches, but this has never been emphasized. The reason for that height is to allow easy reach for referee and setup crew and access of children. At state the tables will be 24 inches. If you want to use our leg system or horses to hold the table, you will need stiffeners. If you use our leg system, I recommend the additional screws into the stiffeners. Leg system instructions are available upon request.

Optional Lights:

Lights are now optional. There is still a requirement for the lighting to be sufficient and even. This means that if you have a venue which has even lighting, you do not need to construct a means of overhead lighting. I have seen gymnasiums with even overhead lighting that could easily meet the need. Rooms with uneven lighting like arenas, or lower ceilings with spots lights would not. In event setup, often the desire to video the competition and display this on a screen is in conflict with the removal of the overhead light because light on screens need avoided and light on table is needed for the camera's auto focus. The Ohio State Championship will continue to use table overhead lighting. Light system instructions available upon request.

Pictorial Steps of Building Tables is now provided:

Photo (Pix 1) shows the lumber needed for four tables, legs, leg supports and overhead lights.

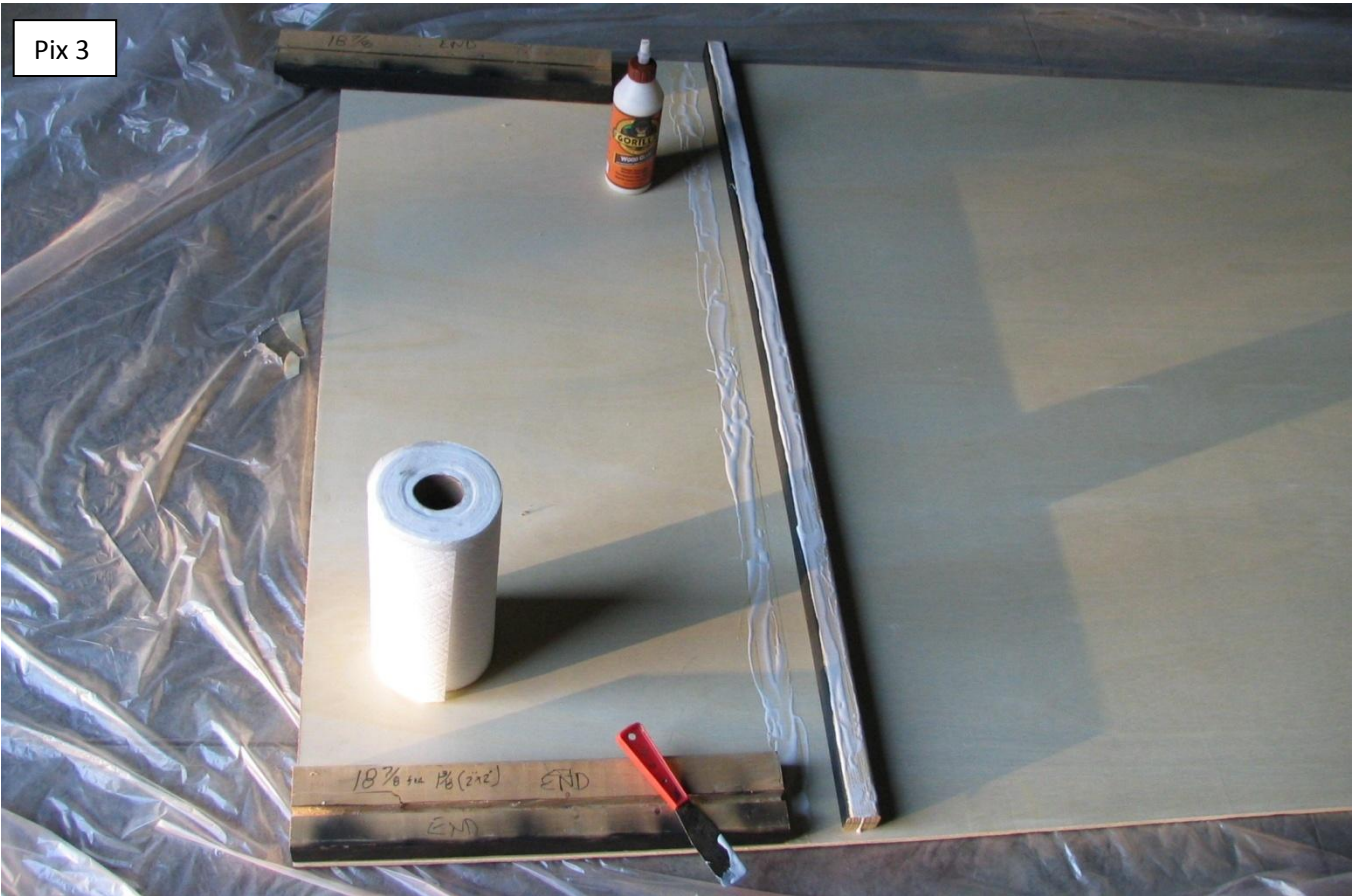


The first thing I do is paint the boards before construction, right out of the truck or van. Photo (Pix 2) show boards on asphalt driveway being paint with roller and some brushing. (Over paint is just more driveway sealer). I think painting the competition field makes it easier to keep clean and looks better. I paint the smoothest side of the veneer. But white paint will be required due to mats being thinner in the future. I don't paint on one side of the 2x2s (convex side if there is one) because I glue it to the unpainted 2nd quality side of the 4x8 sheeting. Then when totally dry, I stack the lumber and wait at least a month allowing the lumber to relax.



Shown in photos (Pix 3, Pix 4 and Pix 5) the plywood sheet unpainted side is place up up on a flat concrete floor, and glue the 2x2 stiffeners/ribs. To hold the ribs in place, I use bags of water conditioning salt that I delay putting in the soft water tank (or buy a little extra) for the task. The 4 foot long 2x2 ribs are glued with the bags holding them in position while drying. Occasionally a stubborn board will cause me to resort to a temporary screw. The short boards are jigs used to set the placement of the ribs. If there is a bow in the 2x2, I make the gap in the center which will be pressed out with the applied weight of the bags of salt. The hammer is used to adjust the position of ribs before the glue sets.

Pix 3



Pix 4

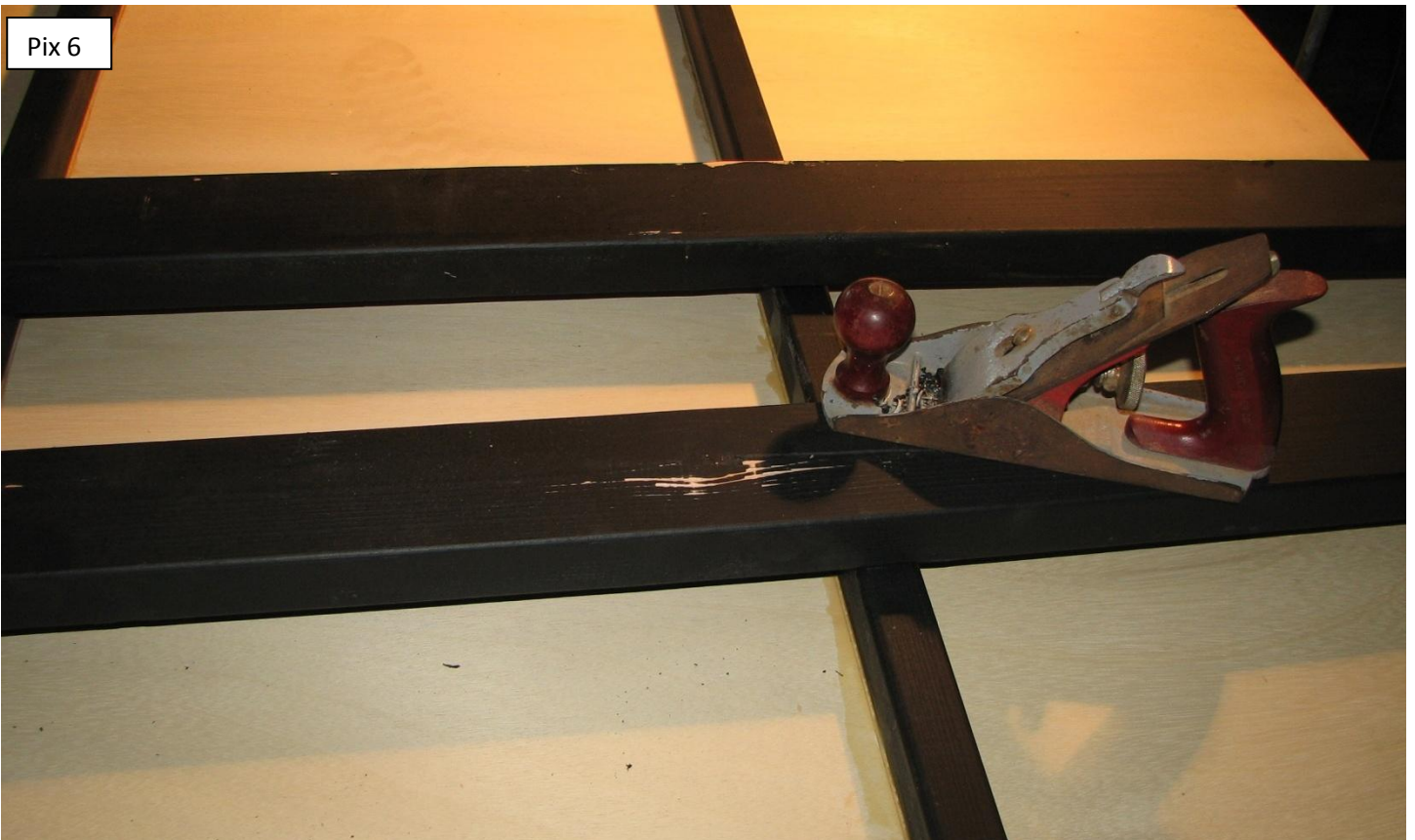


Pix 5

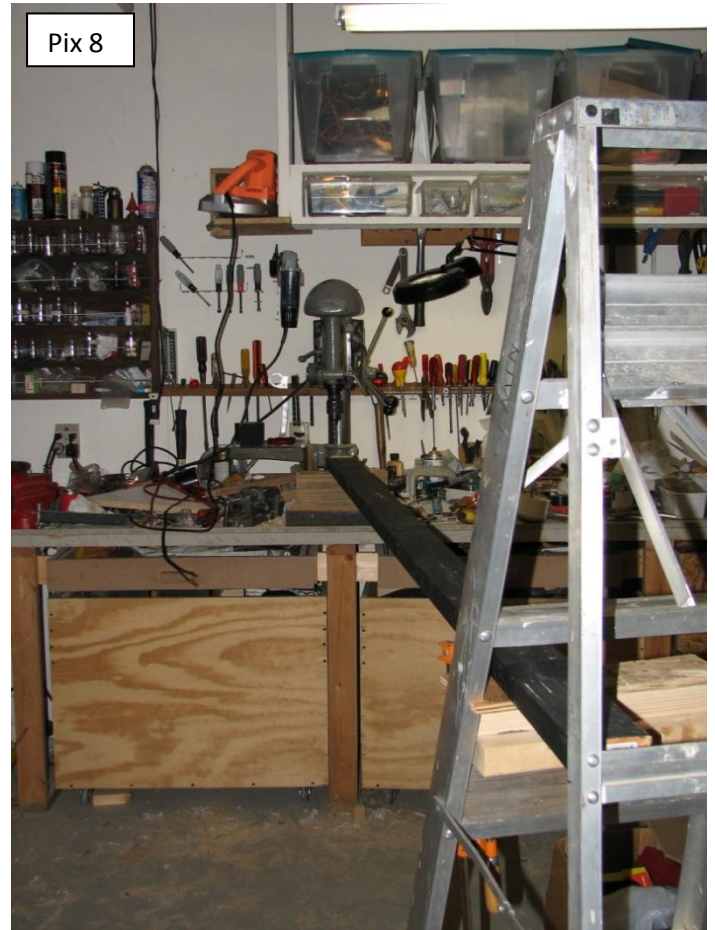


Working with the 2x4s, I select the best lumber for the sides as described in the introduction text. As shown in photo (Pix 6) using a plane, wood putty, and maybe sandpaper, I make the 2x4s surfaces that are selected for the inside and top smooth.

Pix 6



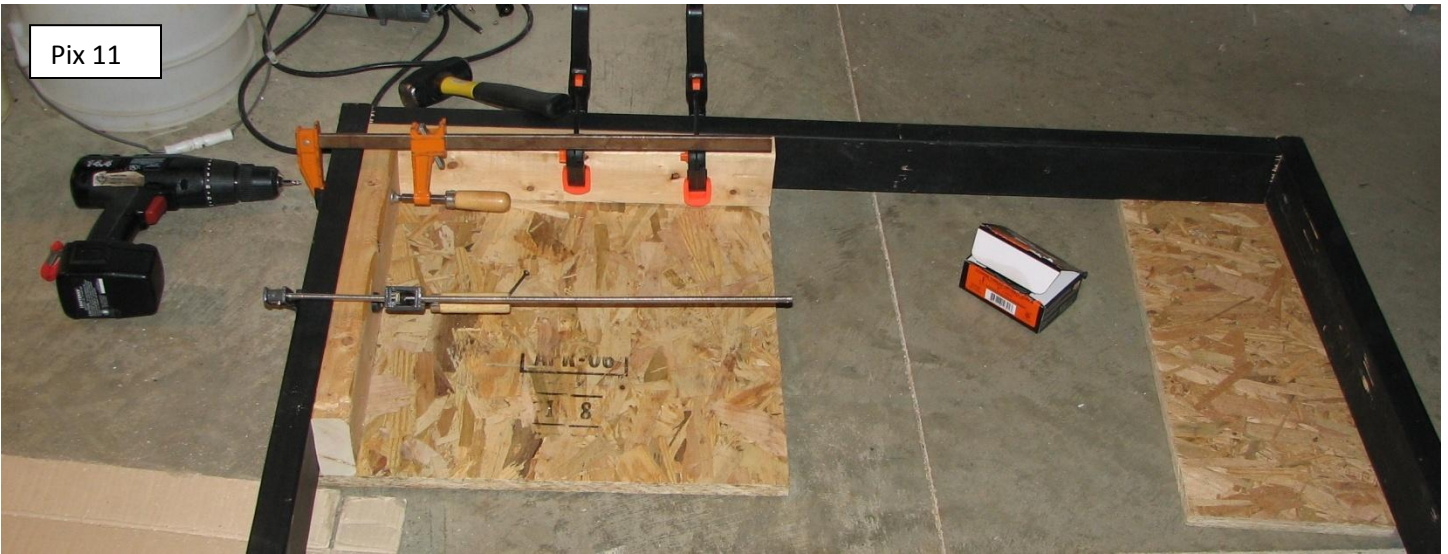
In photo (pix 7) drill two holes large enough to easily accept the 3 inch drywall screws to be used to fasten the 45 inch boards to the 8 foot boards. Notice the example jig (Pix 8) to allow one man to do this task.



Using the right angle jig (Pix 9 and 10) previously discussed, the sides are assembled using the selected prefinished 45 inch and 8 foot 2x4s.

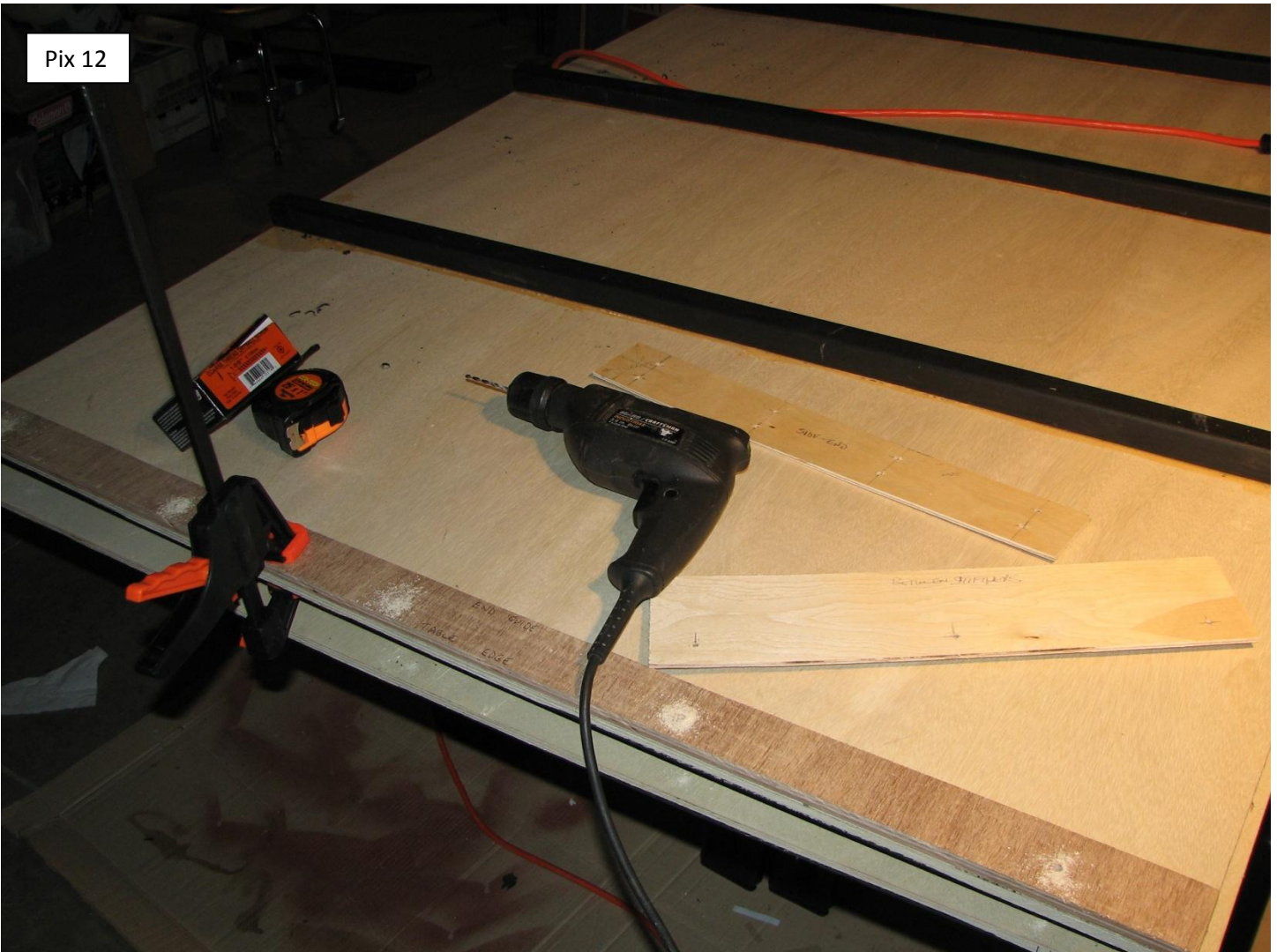


Pix 11



If 2x4s in photo (Pix11) have a slight bow have the frame bow out, allows clamps to pull in. The 4x8 sheet in photo (Pix 12) is prepared to be screwed to 2x4s frame shown completed. Holes are drilled that allow 1 5/8 inch long screw to be inserted. Jigs are used for placement of holes to reduce error and speed positioning. The location of the jig holes took into considered the 3 inch screws in 2x4s and insured the screws do not collide (no screws holding down sheeting with in 3 inch of edge).

Pix 12



After drilling the screw holes the sheet is flipped over and the 2x4 frame is placed on top. See photo (Pix 13). Any board found non parallel is made straight by clamping. Check for a consistent 45 inches and equal cross corner measurements. Clamp as needed then screw from bottom up. Use torque setting on drill so screw heads are flush but not pulled through sheeting.



The following of photos Pix 14 and Pix15 is optional. The addition of screws into stiffeners will add durability. I mainly do this because two of the stiffeners are used with legs. The jig shown is used to locate where to drill holes through sheet for screws. It works with the round magnets shown. With the jig in place, simply drill between magnets using a bit that allows a 1 ¼ drywall screw to pass through sheeting. Use a drill stop or a drill bit flag tape (as shown) to limit drill depth to sheet thickness. Countersink to allow covering with wood putty (used larger drill bit as counter sink- light touch required). After this step, touch up paint, and you are done with table or tables. Note if you are constructing multiple tables at one time, performing most of the above tasks are best done for all tables at one time, until you near the final steps.

Pix 14



Pix 15



If you are interested in tips on building legs and leg braces (shown below) let us know.



Also let us know if you want tips on competition light fixtures and associated sign holder shown below. The light fixture cross member is hinged to the upright supports for ease in transport and storage.



Requests for additional information, details about jigs or if you wish to discuss some of the ideas presented, please contact me, Bob Gemin, at the Educational Outreach Office, Wright Patterson AFB, Ohio.

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